BULLETIN

OF THE INSTITUTE OF METALS

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INSTITUTE NEWS

Autumn Meeting : Accommodation in University Halls of Residence

It is probable that a limited amount of accommodation for single and married members will be available in the University Halls of Residence at Sheffield during the Autumn Meeting at Buxton. The facilities are as good as at many second-class hotels. The charge for bed and breakfast is 16*s*. per day for the first three days and 12*s*. per day thereafter. It is desirable that early application should be made, preferably before June 30, if reservations are required. Late applications may be received up to August 31, but a reservation cannot then be guaranteed.

Transport will be provided, free of charge, between Sheffield and Buxton for those registered as attending the Autumn Meeting.

Portrait of the Institute's First President: Presentation by the Institution of Mechanical Engineers.

In the Council Room at 4 Grosvenor Gardens, at 5.45 p.m. on Tuesday, 25 January 1955, Dr. R. W. Bailey, F.R.S., President of the Institution of Mechanical Engineers, presented to the Institute of Metals, on permanent loan, on behalf of the Council of the Institution, a portrait in oils of the Institute's first President, Sir William White, K.C.B., LL.D., D.Eng., Sc.D., F.Inst.Met., F.R.S.

In making the presentation of the portrait, a photograph of which is printed on p. 221 of this issue of the *Bulletin*, the President of the Institution of Mechanical Engineers said :

Your President, Dr. Dorey, and I have been associated on the Council of the Institution of Mechanical Engineers for many years; he was President in 1950, and I shall relinquish my office in about a couple of months' time. This occasion, among my many official duties, will be one which I shall remember with much pleasure.

For many years too, Dr. Dorey and I have enjoyed and benefited by our membership of the Institute of Metals; and, in fact, I do not doubt that there must be a large number of members who are common to our two Societies.

Sir William White was President of the Institution of Mechanical Engineers in 1899 and 1900, and eight years later became the Founder President of the Institute of Metals. Our own Institution was born in Birmingham in 1847, and it is most interesting to see from your records that the first General Meeting of the Institute was also held in that City and that the subsequent Annual General Meeting in 1909 took place in the building of the Institution at Storey's Gate. Thus began a friendly link between the two bodies which has been happily maintained ever since.

Sir John Dewrance and Sir Henry Fowler were both Presidents of the Institution of Mechanical Engineers and also served as Presidents of the Institute of Metals, while others of your Presidents, Sir Gerard Muntz, Engineer Vice-Admiral Sir Henry Oram, and Engineer Vice-Admiral Sir George Goodwin, were at one time Members of our Council. Among the original members of the Institute of Metals, I noticed such well-known names as Sir Robert Hadfield, Sir Charles Parsons, W. H. Allen, and Joseph Adamson, which emphasizes the several kindred engineering interests of the Institution of Mechanical Engineers and the Institute of Metals.

The Institute of Metals will shortly be celebrating its Fiftieth Anniversary, and I think it appropriate to give the following short quotation from the Presidential Address of Sir William White, which is entitled " The Institute of Metals : Its Origin and Objects " : it reads :

> " On your behalf I desire publicly to express the gratitude which the founders of the Institute of Metals feel towards the Council of the Institution of Mechanical Engineers for the generous and friendly attitude assumed by them towards the new Society, whose work will traverse a field, in the exploration of which the older Institution has been one of the pioneers (properties of non-ferrous metals) (properties of alloys of aluminium with other metals). We have been hospitably entertained in the house of the Institution of Mechanical Engineers and granted facilities for holding meetings of the Council and of members of the Institute. The President of that Institution has done us the honour of accepting a seat on our Interim Council, and in Mr. Hurry Riches we find a colleague whose wide experience and great professional ability will be of immense value in the organization of our Society. On many grounds it is important that this friendly feeling shall continue and grow, especially in the interests of the Institute of Metals."

Ladies and gentlemen, I hope that today is another landmark in the history of the Institute and of the esteem with which the Institution of Mechanical Engineers regards the Institute of Metals. Dr. Dorey, on behalf of my Institution I ask you, as President of the Institute of Metals, to accept on loan our portrait of your Founder President, Sir William White.

The President, Dr. S. F. Dorey, F.R.S., on behalf of the members of the Institute of Metals, warmly thanked the Council of the Institution of Mechanical Engineers for its most welcome and friendly gesture in offering the portrait to the Institute. He said that it gave him, personally, particular pleasure that he should be the President of the Institute on that occasion, as it so happened that Sir William White and he had both begun their careers in a Naval dockyard, and had been Presidents of the Institution of Mechanical Engineers, the Institute of Marine Engineers, and the Institute of Metals.

The President-Elect, Dr. Maurice Cook, seconded the vote of thanks.

After the meeting, the Council of the Institute of Metals entertained members of the Councils of the Institution of Mechanical Engineers, the Iron and Steel Institute, and others at a cocktail party.

Election of Members

The following 9 Ordinary Members, 4 Junior Members, and 1 Student Member were elected on 25 January 1955:

As Ordinary Members

Aadland, Sverre, Technical Manager, Norsk Zinkvalseverk A/S, Sundlökken, Sarpsborg, Norway.

Bee, Kenneth William, Assistant to the Sales Manager, (Metals and Alloys Division), Murex, Ltd., Rainham, Essex.

Bernhardt, Eugen, Dr.-Ing., Wissenschaftlicher Mitarbeiter, Carl Zeiss, Oberkochen (Württ.), Germany.

Ennor, William Trehane, B.S., Assistant Director of Research, Aluminum Research Laboratories, Aluminum Company of America, P.O. Box 772, New Kensington, Pa., U.S.A.

Hultgren, *Professor* Ralph Raymond, M.S., Ph.D., Professor of Metallurgy, University of California, Berkeley 4, Calif., U.S.A.

Jameson, George Ross, Metallurgical Engineer and British Representative, Harvey Machine Co., Inc., Torrance, Calif., U.S.A.

Moran, Leslie Owen, Metallurgist, Joseph Lucas (Electrical), Ltd., Shaftmoor Lane, Birmingham.

Rodgers, Alan, M.Met., Metallurgist, Research Department, English Steel Corp., Ltd., Sheffield.

Wallis, William Ballantyne, President, Pittsburgh Lectromelt Furnace Corp., P.O. Box 1257, Pittsburgh 30, Pa., U.S.A.

As Junior Members

Bhattacharjee, Supriya K., B.Sc., Post-Graduate Research Student, Metallurgy Department, The Royal Technical College, Glasgow, C.1.

Cooper, Gervaise Maurice Geoffrey, B.Sc., Flying Officer, Technical (Engineering) Branch, Royal Air Force, at the Radio Engineering Unit, Henlow, Beds.

Pagan, Albert Victor, B.Sc., Assistant Lecturer in Metallurgy, Constantine Technical College, Middlesbrough.

Reitsma, Louis John, Jr., B.S., Graduate Student in Metallurgy, Missouri School of Mines and Metallurgy, Rolla, Mo., U.S.A.

As Student Member

Weiner, Robert Thomas, B.Sc., Postgraduate Student, Department of Physical Metallurgy, University of Birmingham.

PERSONAL NOTES

Mr. F. C. Braby has been appointed a Deputy Lieutenant of the County of Kent.

Mr. J. F. G. Condé has left The Mond Nickel Co., Ltd., and is now a Senior Scientific Officer at the Admiralty Gunnery Establishment, Southwell, Portland, Dorset.

Professor A. H. Cottrell has resigned his post as Professor of Physical Metallurgy at the University of Birmingham, in order to take up an appointment as Deputy Head of the Metallurgy Division and Head of the Physical Metallurgy Group at the Atomic Energy Research Establishment, Harwell.

Mr. C. J. F. Francis-Carter has been appointed Managing Director of the Aluminium Wire and Cable Co., Ltd., Swansea. He has been General Manager of the Company since 1947.

Dr. Max Hansen, who has been associated with the Armour Research Foundation, Chicago, Ill., for the last six years, has returned to Germany to join Metallgesellschaft A.G., Frankfurt-am-Main, as Vice-President in charge of development.

Dr. J. H. Hollomon, Manager of the Metallurgy Department, General Electric Research Laboratory, Schenectady, N.Y., has been named as one of America's ten outstanding young men of 1954 by the National Junior Chamber of Commerce.

Mr. H. E. Jackson, late President of the British Non-Ferrous Metals Federation and formerly Chairman of Imperial Chemical Industries, Ltd., Metals Division, was awarded the C.B.E. in the New Year Honours List.

Mr. J. B. Marriott has left the Royal Technical College, Glasgow, and joined the Research Laboratory of Associated Electrical Industries, Ltd., Aldermaston, Berks.

Mr. R. T. Rolfe is retiring after 42 years' service with W. H. Allen, Sons and Co., Ltd., Bedford. For 35 years he has been Chief Metallurgist. He is succeeded in this post by his deputy, Mr. J. R. Bryant.

Dr. A. H. Sully has been appointed Associate Director of Research of the British Steel Castings Research Association, Sheffield. He had been Principal Physicist to the Fulmer Research Institute for some years.

Dr. K. Winterton has relinquished the post of Chief Metallurgist (Ferrous) to the British Welding Research Association to take up an appointment as Assistant Director of the Metallurgical and Engineering Department, Ontario Research Foundation, Toronto, as from 1 March.

Dr. P. A. Young has resigned the Elmore Research Fellowship in Extraction Metallurgy at Cambridge University and taken up a post in the Development Department, Imperial Smelting Corporation, Avonmouth.

Death

The Editor regrets to announce the death of:

Mr. Ernest Millington, an Original Member of the Institute, at his home at 27 Manor Road, Borrowash, Derby, at the age of 81. After his retirement from the post of Chief Works Metallurgist of the London, Midland, and Scottish Railway Co. in 1936, he acted as Consultant Metallurgist to the Incandescent Heat Co., Ltd.

SIR WILLIAM H. WHITE, K.C.B., LL.D., D.ENG., SC.D., F.INST.MET., F.R.S.
First President of the Institute of Metals, 1908

NEW OFFICERS

Below are given some biographical details of members who take office as President, Vice-President, and Ordinary Members of Council at the Annual General Meeting on 30 March.

Dr. Maurice Cook

(President)

Born at Hartlepool in 1897, Maurice Cook received his metallurgical education and training at the Universities of Manchester and Cambridge. He graduated B.Sc., with first

class honours in Metallurgy, in 1919, and was awarded the Leblanc Medal. He obtained the M.Sc. degree in 1920, and was subsequently awarded the Ph.D. (Cambridge) and D.Sc. (Manchester) degrees and the Honorary Associateship of the Birmingham College of Technology.

From 1919 to 1921 he was engaged in research and lecturing at Manchester University, and from 1921 to 1924 he carried out research in the Goldsmiths' Laboratory at Cambridge. From 1924 to 1926 he was on the technical staff of Messrs. C. A. Parsons and Co., Ltd., Newcastle-upon-Tyne. He joined the staff of Kynochs, Ltd., in 1926, became Research Manager of the Metals Division of Imperial Chemical Industries, Ltd., in 1938, was appointed a Director in 1942 and a Joint Managing Director in 1951.

Dr. Cook has served on the General Council of the British Standards Institution, the Inter-Service Metallurgical Research Council, the Welding Research Council, the Council of the Electrodepositors' Technical Society, and the Ministry of Supply Metallurgy Committee, and he has been Chairman of the Midland Metallurgical Societies, President of the Birmingham Metallurgical Society, and President of the Institution of Metallurgists, of which he is a Founder Fellow. He is Chairman of the British Non-Ferrous Metals Research Association, Chairman of the Metallurgy Advisory Committee of the City of Birmingham Education Department, and a member of Council of the Aluminium Development Association.

He is the author of many papers, about forty of which have been published in the Institute's *Journal*, covering a wide range of non-ferrous metallurgical subjects, including the constitution of alloys, the physical and mechanical properties of metals and alloys, deformation, recrystallization, and grain growth in metals, metal melting, casting, and rolling, the testing of materials, welding, electrodeposition, and the history of metallurgy.

In 1953 he delivered the Autumn Lecture at the Southport Meeting of the Institute, and last year the Robert Horne Memorial Lecture to the Society of Chemical Industry.

Elected a member in 1918, Dr. Cook has rendered prominent service to the Institute of Metals. He was Chairman of the North East Coast Local Section in 1926–27, Chairman of the Birmingham Local Section in 1934–36, served as a Member of Council from 1939 to 1943 and 1947 to 1951, and as a Vice-President from 1943 to 1946 and 1954 to 1955. He has been a member of most of the Institute Committees and as a member of the Publication Committee, in particular, for many years gave invaluable advice and practical assistance.

Mr. W. J. Thomas

(Vice-President)

William John Thomas was born in 1894, and received his preliminary engineering training as a pupil to engineering consultants, with technical training at Cardiff Technical College and later at the Herriot–Watt College, Edinburgh. He subsequently extended his experience in various engineering posts with Baldwins, Ltd., Cammell–Laird & Co., Ltd., Vickers, Ltd., and Metropolitan-Vickers Electrical Co., Ltd.

Mr. Thomas joined The British Aluminium Co., Ltd., in 1924, as an Assistant Engineer in their Head Office, and has since occupied the position of Works Manager, Technical Manager, and General Production Manager. He is now Joint Managing Director of the Company and also a Director of several subsidiary and associated companies in Britain and overseas.

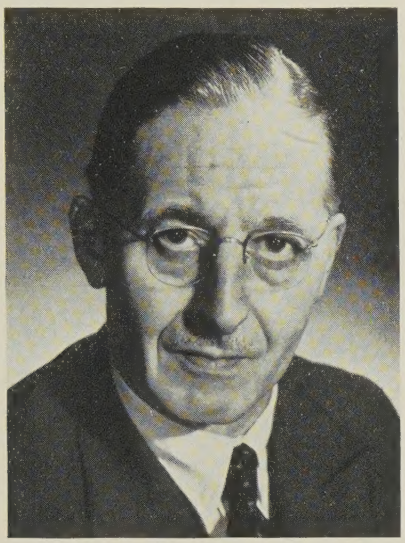
Mr. Thomas is a member of the Institution of Electrical Engineers and the Institution of Mechanical Engineers, and he and one of his colleagues were joint recipients of the first

award of the W. H. A. Robertson Medal by the Institute of Metals, for a paper on " Some Technical Problems Influencing Production Economy in the Rolling of Aluminium ". He has been a member of the Institute since 1926, and has served as an Ordinary Member of Council since 1952. He is Chairman of the Metallurgical Engineering Committee.

Mr. L. E. Benson

(Ordinary Member of Council)

Leonard Ellis Benson was born in 1895 and educated at Sidcot School and Manchester University. Here his academic career was interrupted by 3½ years' service in the Friends



Ambulance Unit, working with the French Army during the First World War. His early studies at the University were in the Schools of Agriculture and Chemistry, but later he changed to the School of Metallurgy, from which he graduated with an honours degree and a Simon Carves Scholarship in 1921. Postgraduate research led to the degree of M.Sc. in 1922.

Since 1922 Mr. Benson has been employed by Metropolitan-Vickers Electrical Co., Ltd., where he is now in charge of the Metals Group of the Research Department, with the title of Chief Metallurgist. For many years he has been responsible for the quality of the most important metals and alloys used in the construction of the Company's products. He has also been associated with development work on steam and gas turbines, electrical equipment, and other special products.

He is a Fellow of the Institution of Metallurgists, and has served a term on its Council and a term as Vice-President; he has been a member of the Iron and Steel Institute and the Institute of Metals since 1919 and is one of the oldest members and a Past-President of the Manchester Metallurgical Society. He has served on numerous Committees of the British Standards Institution concerned with metals and alloys, and is active also on certain Committees of the British Electrical and Allied Industries Research Association and the British Welding Research Association. He is a member of the Commission 10/11 of the International Institue of Welding concerning Internal Stresses. He is also Chairman of the Committee of Management of Dalton Hall, a hall of residence for students at Manchester University.

Mr. Benson has published numerous papers, particularly on internal stresses and stress-relief in alloys, in the official journals of the Institute of Metals, the Iron and Steel Institute, the Institute of Welding, the Institute of British Foundrymen, and elsewhere.

Mr. C. F. J. Francis-Carter

(Ordinary Member of Council)

Charles Francis Jack Francis-Carter was born in 1904 in London and educated at Queen Mary College. In 1924 he entered the Metallurgical Branch of the Research Department, Woolwich Arsenal, where he worked first under the late Sir William Griffiths and subsequently, on the application of electrodeposition to armaments, under the late A. W. Hothersall.

In 1929, he joined Morris Motors, Ltd., Radiators Branch, where he was engaged on applications of technology to production processes and was responsible for bringing into operation one of the first large-scale automatic electroplating plants in the country.

Shortly after the outbreak of the last war he was appointed to take charge of a Government-sponsored project for the production of aluminium ingot from metal salvaged from crashed and obsolete aircraft. Mr. Francis-Carter was responsible for the planning and operation throughout the war of two plants (the " M.P.R.D.'s "), one in Oxford and a second, larger one, on Tees-side; between them these plants dealt with the combined arisings of metal from the R.A.F. and the U.S.A.A.F. in this country, together with a not inconsiderable quantity of German origin. For this contribution to the national effort, he was awarded the O.B.E. in 1944.

At the end of 1946, he joined the newly formed Aluminium Wire and Cable Co., Ltd., Port Tennant, Swansea, as General Manager, being appointed Managing Director in January, 1955.

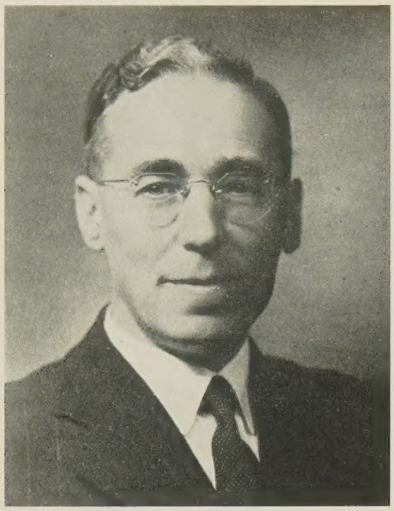
Mr. Francis-Carter has been a member of the Institute of Metals since 1936. He has served on the Council of the Electrodepositors' Technical Society and took part in the formation of the Midlands Centre of that Society in 1933. He is a

Fellow of the Institution of Metallurgists, a Member of the Institution of Chemical Engineers, and a Fellow of the Royal Institute of Chemistry.

Professor Hugh O'Neill

(Ordinary Member of Council)

Hugh O'Neill was born at Sheffield in 1899, and graduated M.Met. at the University of Sheffield in 1921, after a break at H.M. Factory, Oldbury, from 1917 to 1918, and service in the Royal Engineers in 1918–19. He was awarded the degree of D.Sc. of the University of Manchester in 1929.



He was lecturer in Metallurgy at the Birmingham Technical College in 1920–21, and afterwards a lecturer and later Senior Lecturer in Metallurgy at the University of Manchester from 1921 to 1934. He then became Research Metallurgist to the L.M.S. Railway Company, and was Chief Metallurgist from 1935 until 1947. Since that date he has been Professor of Metallurgy at University College, Swansea.

He is author of "The Hardness of Metals and its Measurement" (1934), "Glossary of Terms for Metallurgical Inspection" (1940), and many published scientific papers and articles. He was awarded the Trevithick Premium for a paper to the Railway Division of the Institute of Civil Engineers (1945), and the Price–Abell Medallion of the Derby Society of Engineers (1938). He was twice a Carnegie Scholar of the Iron and Steel Institute, and in 1950 visited extraction plants in Canada and the U.S.A. with a Nuffield Travelling Fellowship.

Professor O'Neill was President of the Manchester Metallurgical Society in 1929–30, and, as President of the Swansea Metallurgical Society, is an Honorary Member of Council of the Iron and Steel Institute. He was a member of the old Welding Research Council and the Research Board of the Welding Research Association until 1949; he is a Past-President of the Institution of Metallurgists, a member of Council of the British Iron and Steel Research Association, and has been Visitor to the British Cast Iron Research Association on behalf of the Department of Scientific and Industrial Research.

In connection with industrial and University work, he has travelled in sixteen foreign countries, and was a member of the British Committee of World Student Relief. He has given W.E.A. and other adult education courses, and was a co-opted member of Derby Education Committee.

Professor O'Neill was elected a member of the Institute in 1921, and has previously served on the Council from 1946 to 1950 and as Vice-President from 1950 to 1953. He was Chairman of the Institute's Publication Committee from 1949 to 1953.

PERSONALITIES

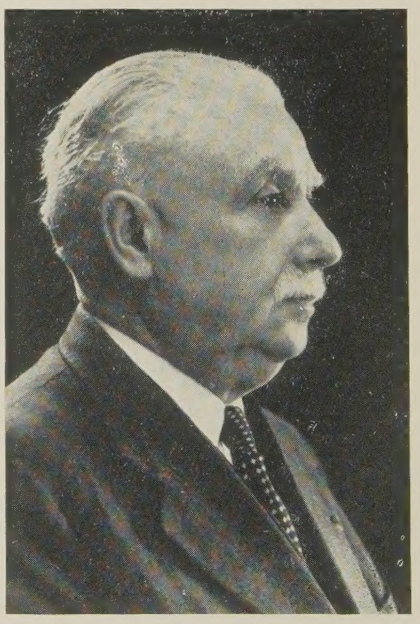
Professor G. Chaudron

Professor Georges Chaudron, who was recently elected a member of the Académie des Sciences (Chemistry Section), was born in 1891. He studied at the Sorbonne, carrying out the work for his doctor's thesis in the laboratory of the famous chemist and metallurgist, Henry Le Chatelier. After serving in the 1914–18 war as an artillery officer, he was appointed, in 1921, deputy director of the mineral chemistry laboratory at the Collège de France. In 1928 he became Professor of Applied Chemistry and Director of the Institute of Applied Chemistry at the University of Lille.

In 1939 Professor Chaudron was appointed to his present posts of Professor of Applied Chemistry at the Sorbonne and Director of the laboratory which had just been built by the Centre National de la Recherche Scientifique at Vitry-sur-Seine.

Professor Chaudron's research work has been mainly in the fields of mineral chemistry and metallography. He has been responsible for establishing diagrams representing the equilibria between hydrogen, carbon monoxide, and the oxides of iron, which constitute the theoretical bases of numerous metallurgical processes, including that of the blast furnace. He will be best known to members of the Institute of Metals for his work on corrosion, surface states, new aluminium alloys, and metals of high purity. As a result of this last work, he has been appointed permanent consultant in metallurgy to the French Atomic Energy Commission.

At the meeting of the Institute of Metals held in Paris in September 1949, Professor Chaudron delivered the Autumn



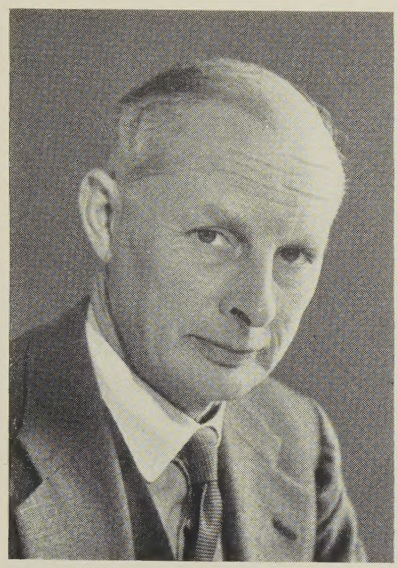
Lecture on "Recent French Investigations in the Field of Light Alloys", in which he dealt particularly with the metallographic studies carried out by himself and his colleagues

(Lacombe, Beaujard, Hérenguel, and others) at the Vitry-sur-Seine Laboratory. He has been a member of the Institute of Metals since 1928.

Dr. C. J. Smithells

(Institute of Metals (Platinum) Medallist 1955)

Colin James Smithells was born in 1892, educated at Bedales and Leeds University, and in 1914 graduated B.Sc. in Chemistry with First Class Honours. He was an 1851



Exhibitioner, and was awarded the degree of D.Sc. of Leeds University in 1921.

From 1914 to 1918 he served in the 9th Bn. The Gloster Regiment and became Second-in-Command, with the rank of Major. He was awarded the Military Cross and was mentioned in despatches.

After the war, in 1919, he joined the Research Staff of The General Electric Company, Ltd., of which he was an original member, and remained there until 1938, when he took up the post of General Manager to Lodge Plugs, Ltd., Rugby. This post he held until 1944, when he was appointed Director of Research of The British Aluminium Company, Ltd., and established the Research Laboratories at Chalfont Park in Buckinghamshire.

Dr. Smithells' main fields of research have been concerned with tungsten in relation to electric lamps; the physics of lamp manufacture; the development of receiving valves; heat-resisting alloys; gas–metal equilibria; and powder metallurgy, leading to the development of the G.E.C. heavy (tungsten–nickel–copper) alloy. He is the author of seven papers published in the *Journal of the Institute of Metals*, and of papers in the *Proceedings of the Royal Society*, &c.; and also of books on "Tungsten", "Impurities in Metals", and "Gases in Metals". He edited the "Metals Reference Book" published in 1949. He was Cantor Lecturer to the Royal Society of Arts in 1938 and 1950.

Dr. Smithells was elected a member of the Institute of Metals in 1922, and has served on the Council as a Chairman of the London Local Section from 1934 to 1936, and later as an Ordinary Member of Council from 1936 to 1940, and 1945 to 1949, and is a Past-Chairman of the Publication Committee and the Meetings Committee. He was a Vice-President from 1949 to 1952 and President in 1952–53. He is a member of the Iron and Steel Institute, the American Institute of Mining and Metallurgical Engineers, and other scientific and technical societies; Past-President and a Founder Fellow of the Institution of Metallurgists, of which he was Hon. Treasurer 1946–51; a Member of Council of the British Non-Ferrous Metals Research Association, a member of its Research Board and Chairman of the Aluminium and Magnesium Industry Committee. He is Chairman of the Research Committee of the Aluminium Development Association and a Governor of Battersea Polytechnic.

In 1918, Dr. Smithells married Mary, daughter of Professor J. B. Cohen, F.R.S., and has two sons and three daughters. His hobbies are painting, bee-keeping, and making furniture.

Mr. W. A. Baker

(Rosenhain Medallist 1955)

William Albert Baker joined the staff of the Assay Office, Royal Mint, London, as a student assistant, and graduated in metallurgy at the University of London as an external student in 1934.

Shortly afterwards he went as an investigator to the British Non-Ferrous Metals Research Association, where he was engaged mainly on problems connected with the melting, casting, and welding of non-ferrous metals, on which subjects he has published numerous papers in the Institute's *Journal*

and elsewhere. He is now Research Manager of the British Non-Ferrous Metals Research Association.

He is a Member of Council and of several Committees of the Institute of Metals and of the Institution of Metallurgists, and represents the Institute of Metals on the Board of Governors of *Acta Metallurgica*.

Professor Hugh Ford

(W. H. A. Robertson Medallist 1954)

Hugh Ford was educated at Northampton School, and started his engineering career as a Premium Apprentice in the Great Western Locomotive Works, Swindon. In 1934 he gained a Whitworth Scholarship and entered the City and Guilds College (Imperial College), London, where he obtained

the B.Sc.(Eng.)(Lond.) degree with first-class honours, being also awarded the Unwin Scholarship (1936). He received his Ph.D. degree after three years' research on heat-transfer and fluid-flow problems.

From 1939 to 1942 he was a research engineer with Imperial Chemical Industries, Ltd., Alkali Division, Northwich, being

mainly concerned with the development of high-pressure plant for polythene manufacture. He was then appointed Chief Engineering Officer in the Technical Department of the British Iron and Steel Federation. In 1945 he became Head of the Mechanical Working Division of the British Iron and Steel Research Association.

In 1948, Professor Ford accepted the Readership in Applied Mechanics at Imperial College, University of London, and was awarded the D.Sc.(Eng.) degree of London. In 1951 he was appointed to his present post of Professor of Applied Mechanics, University of London.

Professor Ford has published many papers in this country and abroad, principally in the field of metal working and mechanical properties of materials. He is Chairman of the Applied Mechanics Group of the Institution of Mechanical Engineers and of the Research Panel of the Admiralty Advisory Committee on Structural Steel.

Mr. J. G. Wistreich

(W. H. A. Robertson Medallist 1954)

John George Wistreich studied mechanical engineering at University College, London, and in 1914 was awarded a first-class honours degree and the College diploma with distinction. He also attended a Dipl.-Ing. course in technology at the Polish University College, London, and carried out post-graduate research in gas dynamics at the City and Guilds College, London; for this he received the degree of Master of Science in Engineering, and the Diploma of the Imperial College of

Science in 1947. Since then he has worked as research engineer with the British Iron and Steel Research Association, on wire drawing, forging, and other metal-working processes. His present appointment as Head of the Metal Working Laboratories of the British Iron and Steel Research Association dates from 1952.

OBITUARY

Dr.-Ing. S. Junghans

The name of Dr.-Ing. Siegfried Junghans, who died at Schorndorf on 5 September 1954, will always be associated with the continuous-casting process which he did so much to perfect. His successful experiments with brass date back to 1927, when the first production-scale plant was erected at the Wieland-Werke in Ulm, where it is still in operation practically unchanged. After holding various posts in the metal industry, Dr. Junghans concentrated from 1936 onwards, at his own factory at Stuttgart, on the development of the continuous-casting process. This reached a production basis for non-ferrous metals before the Second World War, and Junghans plants were installed at various works in Germany and in other countries. During the war a larger factory for research purposes was erected at Schorndorf, where a combined continuous-casting plant and rolling mill was set up. This work was extended after the war, and 1949 saw the successful application of continuous casting to steel.

In recognition of his work, the Technische Hochschule at Stuttgart, where he had been a student, conferred upon Dr. Junghans the honorary degree of doctor of engineering.

During the First World War, Dr. Junghans served in the Torpedo Boat section of the German Navy and became Commander of the Speedboat Flotilla in Flanders. Among the positions which he held in the German metallurgical industry were: technical and commercial director of the Messingwerke Schwarzwald A.G., Villingen (1919–36); director of Gebrüder Junghans A.G., Schramberg (1927–31); managing director of the Schwarzwälder Metallhandel A.G. (1923–36); and technical director of the Wieland-Werke A.G., Ulm (1934–35). He was President of the Chamber of Commerce at Villingen from 1924 to 1933.

Dr. Junghans was elected a member of the Institute of Metals in 1926.

LETTERS TO THE EDITOR

Flecks Appearing on the Surface of Electroplated Metal Subjected to Repeated Stress

Copper coatings electrodeposited on carbon steel specimens have been found by Okubo [1] to exhibit "flecking" when the test-pieces are subjected to torsional fatigue above a critical stress (8·7 kg./mm.^{2} for a 0·89% carbon steel). Below this stress the copper plate is unaffected, and above it the depth of colour and density of the flecks increase with increasing load. The value of the critical stress is dependent on the material being tested and the composition of the electrodeposit, assuming the surface conditions are maintained unchanged.

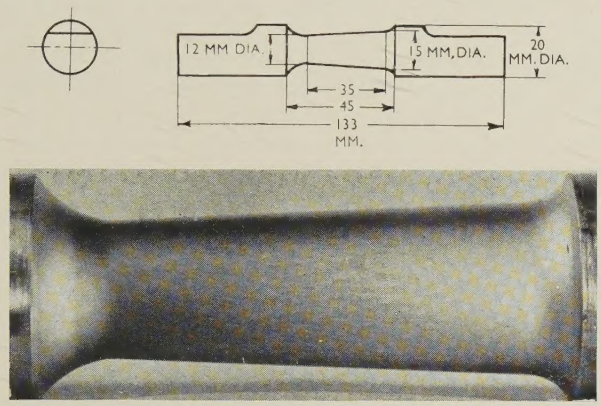


FIG. 1.—Dimensions of Specimen and Flecking Parallel to Axis in Torsion Test.

I have now studied the application of this method to brass stressed in torsion and in rotating bending. The specimens were carefully polished on fine emery paper, and the plating conditions were similar to those employed by Okubo, namely: $CuSO_4.5H_2O$ 250, H_2SO_4 (sp. gr. 1·84) 80 g./l.; c.d. 3 amp./dm.^{2}; temp. 18° C. A preliminary anodic treatment was given, followed by a copper strike in a cyanide solution.

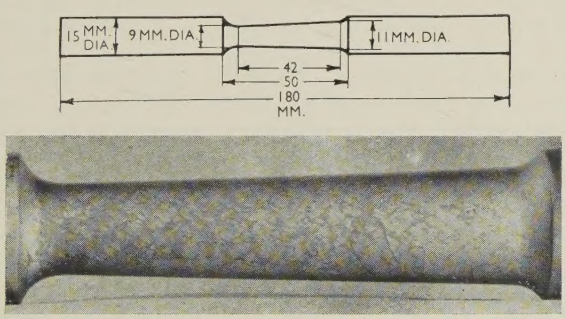


FIG. 2.—Dimensions of Specimen and Flecking at 45° to Axis in Rotating-Bending Test.

In neither test did the maximum value of the cyclic stress exceed the endurance limit of the material. Mechanical-type testing machines were used, the speed being 1800 r.p.m. in the case of the torsional and 1650 r.p.m. in the case of the rotating-bending fatigue test.

Flecking similar to that observed by Okubo, but more distinct, became visible. The disposition of the flecks differed in the two types of test: in the torsion specimen (Fig. 1) the flecks ran parallel to the axis of the test-piece; in the bend-test specimen their direction was at 45° to the axis, and the bands could be seen to intersect one another (Fig. 2). The disposition of the flecks thus indicates the directions of principal shear stress in the specimen, and from the depth of colour of the flecks the magnitude of the surface stress at any particular point can be accurately estimated. This is particularly valuable in the case of specimens of irregular shape.

No explanation of the cause of the appearance of the flecks can at present be advanced. It seems, however, to depend mainly on the material of the specimen; it is found, for instance, that no flecks become visible when the specimen is of pure copper. The interposition of an electroplated layer of zinc, iron, or brass, between the brass specimen and the copper plate does not seem materially to affect the results.

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REFERENCE

1. H. Okubo, *J. Appl. Physics*, 1953, **24**, 1130.

The Behaviour of Specimens in Tensile Creep Tests and in the Ordinary Tensile Test

There are sometimes differences in the alterations of shape experienced by specimens subjected to tensile creep tests and to ordinary tensile tests. One difference is that necking is often more localized in tension tests. Another is that when accelerated creep sets in because of the reduction in cross-sectional area that accompanies stretching, it may do so without necking and may continue up to extensions of tens of per cent., when the creep rate may be three or four times the rate at the start of secondary creep. This differs from the analogous situation in a tensile test reached at the strain corresponding to the ultimate tensile strength, when further extension invariably leads to necking. A third difference is that, in a creep test, after one neck has begun to form at one place another may not infrequently start elsewhere. In tensile tests, on the other hand, although double necks are known they are very rare.

The purpose of this letter is to suggest an explanation of these differences between creep and tensile tests. The mechanism described should operate in all materials, although in any but structurally stable ones it may be masked by more intense effects. The essential feature of the explanation is that these differences depend on the difference in stress sensitivity of the rate of flow in the two tests; in a tensile test the applied stress equals the instantaneous flow stress, and the rate of flow increases much more sharply for a small increase in stress even than it does in a creep test, where the applied stress is less than the flow stress. This is shown by the fact that in a tensile test the applied stress has only to be raised slightly above the flow stress for a rapid strain to take place that is much faster than the rate of strain during a creep test. Consequently, in a tensile test the rate of flow very rapidly accelerates at the position along the specimen where necking begins, and particularly at the root of the neck. As necking proceeds, deformation and the attendant further reduction of section concentrate more and more sharply in the root. A shorter length of the specimen takes an active part in deformation than when the stress sensitivity is less, as in a creep test, and so the neck is more localized. This is one of the experimental observations.

The explanation of the other observations depends on the further fact that plastic flow is due to the movement of dislocations; in particular, it depends on the fact that the movement of each dislocation has a certain probability of taking place in unit time. In a creep test this probability is comparatively small. The stress is not high enough to move any dislocation instantaneously. Before a dislocation can move, it has to wait until a sufficiently large thermal fluctuation arrives to help it over the obstacle lying in its way. When one moves, then if the condition has been reached where the movement of one raises the local stress enough, by reducing the section, to assist the movement of others, the probability that others will move increases, and so on, and we have accelerated creep. But for necking to be seen, a larger number of dislocations must move in a big enough piece of the specimen, in, say, a piece 1 cm. long, than in a piece of similar size elsewhere along the specimen. As each dislocation on moving produces only a very small strain, this is a problem on the statistical scale. The extra number of dislocations that must move in one piece before necking can be seen is rather large. The unequal condition therefore takes time to build up. So we have accelerated creep for a while before necking becomes visible, which is the second of the experimental observations. In a tensile test the dislocations move in extremely rapid, not to say catastrophic, succession as soon as the local increase in stress occurs. The probability of movement for many neighbouring dislocations suddenly becomes almost a certainty. An unequal condition therefore builds up quickly and necking rapidly becomes visible. This is the second point of difference.

Because creep tests are lengthy, there is evidently time enough for necking to have a high probability of starting at other places before fracture stops the process. This is the remaining experimental observation. In a tensile test the time available must be too short for this to happen before the load is reduced. After the load is reduced, dislocations outside the necked region will have no chance of moving, since the applied stress there is then less than the flow stress. The way in which tensile tests are conducted often helps in this, as the load is usually reduced soon after necking first begins.

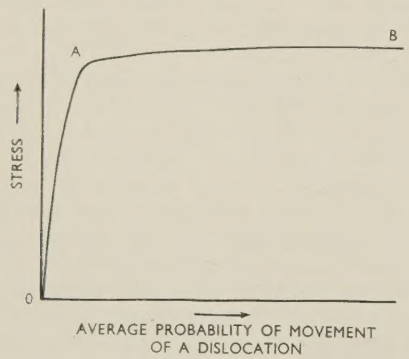

FIG. 1.

The difference between tensile and creep tests is illustrated in Fig. 1. Here the stress is plotted against the probability that a dislocation will move. The point *A* marks the flow stress, since at *A* there is a very rapid increase in this probability for a small increase in stress. Tensile tests are conducted at this point. Creep tests are conducted at stresses along *OA*. Although an increase of stress in this region may cause a big percentage increase in probability, corresponding to the high stress-sensitivity of creep rates, the increase is trivial compared with that near *A*.

The work described in this letter has been carried out as part of the General Research Programme of the National Physical Laboratory, and is published by permission of the Director of the Laboratory.

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JOINT ACTIVITIES

National Certificates in Metallurgy

The secretarial arrangements for the Joint Committee for National Certificates in Metallurgy have been taken over by the Institution of Metallurgists. All future correspondence with the Joint Committee should be addressed to: The Secretary, The Joint Committee for National Certificates in Metallurgy, 28 Victoria Street, London, S.W.1. (ABBey 4922/3).

NEWS OF LOCAL SECTIONS AND ASSOCIATED SOCIETIES

London Local Section

At a meeting of the Section held at 4 Grosvenor Gardens, London, S.W.1, on 6 January 1955, Professor A. H. COTTRELL (University of Birmingham) spoke on:

Some Aspects of Twinning and Kinking in Metals

He said that twins and kinks in crystals were distinguished by the fact that, across a twin boundary, the change in orientation was fixed precisely by the lattice symmetry which governed the twin, whereas across a kink boundary this angle was variable.

Kink boundaries consisted of walls of ordinary slip dislocations which, in certain crystals, could glide under stress along their slip planes. Kinking was a process of plastic bending by slip. It could occur by compression parallel to basal planes in hexagonal crystals, and in bent regions round deformation twins and near testing grips. In tensile deformation it occurred when there was local softening of the metal, due either to rotation of slip planes (geometric softening) or to a change in the material itself (e.g. a yield drop). Under certain circumstances, the boundary of the kink could be made to move along the specimen, producing a simple kind of Lüders band. In other cases, numerous immobile kinks might be formed, e.g. deformation bands in aluminium.

Deformation twins grew by the movement of twinning dislocations. Frank and Stroh had shown that the stress concentration at the tip of a large lens-shaped kink was sufficient to create new dislocations there, and a similar mechanism could account for the rapid spreading of deformation twins across a crystal. Large parallel-sided twins could grow by a process involving spiralling dislocations, suggested by Cottrell and Bilby and by Thompson and Millard. Twin nuclei were formed only with difficulty, in regions of high local stress concentration. These stress concentrations might be provided by the tip of a crack, as shown by Bilby, Deruyttere, and Greenough, or by an indentation with a sharp knife, as shown by Garber, or by a pile-up of dislocations in a slip plane, as shown by Bell and Cahn. In the absence of such stress concentrations, twins were not nucleated until the (uniformly)

applied stress approached the order of magnitude of the theoretical lattice strength.

South Wales Local Section

At a meeting of the Section held at University College, Swansea, on 5 January 1955, Dr. U. R. Evans, F.R.S. (University of Cambridge) gave a lecture on:

Oxidation of Metals

He said that when an oxygen atom took up two electrons, it acquired a structure and stability comparable to those of inert gas atoms; metals could often supply electrons and the combination of a metal with oxygen generally represented the passage to a stabler system and could therefore proceed spontaneously. However, except where the oxide was porous, the rate of oxidation tended to fall off as the film thickened, shielding the metal from oxygen; at low temperatures in dry air, oxidation soon became inappreciably slow. In this respect, dry oxidation differed from wet corrosion, where oxygen took up electrons at one place, whilst the metal passed into the liquid as cations (atoms short of electrons) at another; such reactions could often continue without retardation.

The fact that at high temperatures oxidation continued at all was connected with defects in the oxide lattice. Cuprous oxide contained less copper than corresponded to the text-book formula, Cu_2O, and there were vacancies in the oxide lattice, which were quite mobile at high temperatures. In a block of cuprous oxide at 1000° C., the movement would be sporadic, but where copper was covered with a cuprous oxide film separating the metal from air, the potential gradients present directed the movement in such a way as to maintain film thickening. The rate of oxidation could be predicted from the electrical properties of the film substance, and there was good agreement between observed and calculated values.

In other oxides, there might be more metal (or less oxygen) than corresponded to the text-book formulæ (e.g. ZnO or Fe_2O_3).

In most cases where the vacancies (or excess ions) were mobile in the absence of a potential gradient (which merely served to direct the movement, not to cause it), the growth rate was inversely proportional to the thickness—giving the parabolic equation. At low temperatures, there would often be no appreciable movement in the absence of a gradient, and then theory indicated the inverse logarithmic equation. In cases where the area affected by oxidation diminished with time, other relations, such as the direct logarithmic equation, were met with. The passage from the logarithmic equation (at low temperatures) to the parabolic equation (at higher ones) had been studied on iron by Vernon and his colleagues at Teddington and by Eurof Davies at Cambridge.

Minor constituents in a metal might either increase or decrease the oxidation rate. Where the minor constituent entered the main oxide film, it might either increase or decrease the number of vacancies, according to its valency, and the effect on the oxidation rate could be predicted from Hauffe's valency rule. In such cases, the nature of the growth law was not changed, but only the numerical value of the growth constant. However, if the oxide of the minor constituent accumulated as a separate phase at the base of the main film, the area available for oxidation diminished with time, and the parabolic growth law was replaced by another law more favourable to the cessation of growth. This was a more valuable principle for practical purposes.

OTHER NEWS

Sixth Empire Mining and Metallurgical Congress

The Empire Council of Mining and Metallurgical Institutions announces that the Sixth Empire Mining and Metallurgical Congress will be held in Canada during 1957, by kind invitation of the Canadian Institute of Mining and Metallurgy.

Full particulars are expected to be circulated within the next few months to members of the principal mining and metallurgical societies in the Commonwealth. Meanwhile, some particulars will be available from the Honorary Secretary, Empire Council of Mining and Metallurgical Institutions, 438, Salisbury House, London, E.C.2.

International Foundry Congress 1955

An International Foundry Congress, organized by the Institute of British Foundrymen, will be held in London from Sunday, 19 June, to Saturday, 25 June 1955. The Congress will start with a garden party on the afternoon of 19 June, and the official opening ceremony will take place at the Dorchester Hotel on the morning of 21 June. Dr. A. B. Everest will deliver his Presidential Address and Dr. T. E. Allibone will present the 18th Edward Williams Lecture on "Metals Perfect and Imperfect". Technical sessions and works visits will be held during the week, and, beginning on Sunday 26 June, there will be two post-congress tours in the provinces. The first of these will embrace the Birmingham, East Midlands, and Manchester areas, and the second, Glasgow, Newcastle, and Sheffield. Details may be obtained from the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester 3.

DIARY

The Institute

29 March. May Lecture: "The Nature of the Real Crystal", by Professor F. C. Frank, O.B.E., F.R.S. (The Royal Institution, 21 Albemarle Street, London, W.1, at 7.0 p.m.)

30 March–1 April. Annual Spring Meeting. (For full programme see the January issue of the *Bulletin*, pp. 203–205.)

Local Sections and Associated Societies

21 March. Sheffield Local Section. "Protection of Steelworks from Atmospheric Corrosion", by Dr. F. R. Himsworth. (University Buildings, St. George's Square, Sheffield, at 7.30 p.m.)

22 March. South Wales Local Section. Annual General Meeting, followed by films. (Metallurgy Department, University College, Singleton Park, Swansea, at 6.45 p.m.)

24 March. Birmingham Local Section. "Shielded-Arc Welding", by Dr. E. C. Moore. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)

29 March. Oxford Local Section. Annual General Meeting, followed by a Discussion on "Non-Destructive Testing", introduced by Dr. E. G. Stanford. (Cadena Café, Cornmarket Street, Oxford, at 7.0 p.m.)

31 March. Liverpool Metallurgical Society. Conversazione. (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.0 p.m.)

7 April. Birmingham Local Section. Annual General Meeting. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)

14 April. Liverpool Metallurgical Society. Annual General Meeting, followed by: "Materials Resistant to Creep at High Temperatures", by A. W. Franklin. (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.0 p.m.)

14 April. London Local Section. Annual General Meeting, followed by a Discussion on "Recent Developments in Special Machining Techniques". (Place to be subsequently announced.)

18 April. Sheffield Local Section. Films. (University Buildings, St. George's Square, Sheffield, at 7.30 p.m.)

Other Societies

23 March. Institute of British Foundrymen, Birmingham Branch. Works Visit to Sterling Metals, Ltd., Nuneaton (at 2.30 p.m.) "Running and Feeding Methods for Light Alloys", by W. J. Sully. (At Sterling Metals, Ltd., Nuneaton, at 7.15 p.m.)

24 March. Institute of British Foundrymen, Northampton and District Section. "Pattern Making for Production Moulding", by S. A. Horton. (The Plough Hotel, Northampton, at 7.30 p.m.)

28 March. Institute of British Foundrymen, Sheffield Branch. "Foundry Safety: Some Effects of Changing Legislation", by R. F. Ottignon. (College of Technology, Pond Street, Sheffield, at 7.15 p.m.)

30 March. Institute of British Foundrymen, London Branch. "Safety in the Foundry", by A. Talbot. (Waldorf Hotel, Aldwych, London, W.C.2, at 7.30 p.m.)

30 March. Institute of British Foundrymen, West Riding of Yorkshire Branch. "Sand for Floor Moulding", by W. B. Parkes. (The Technical College, Bradford, at 6.30 p.m.)

30 March. Society of Chemical Industry, Corrosion Group. Spring Lecture: "Attention to Corrosion in U.S.A.", by F. L. LaQue. (Church House, Great Smith Street, London, S.W.1, at 6.30 p.m.)

31 March and 1 April. Society of Chemical Industry, Corrosion Group. A Symposium on the Protection of Structural Steel. (Institution of Civil Engineers, Great George Street, London, S.W.1, at 9.30 a.m. and 2.30 p.m. each day.)

APPOINTMENTS VACANT

ALUMINIUM DIE-CASTING. Manager required in Midlands for complete charge of die-casting department, capable of building up organization for increased output on modern lines of economical production and quality control. Sound practical and technical knowledge of gravity die-casting (preferably pressure also) and of really up-to-date methods of die design and castings production; management experience essential. Key position offering full scope for ability, enthusiasm, and determination. Applications (in confidence) invited from men with past record justifying initial salary of £1500, actual figure depending on qualifications and experience. Desired age 35/45. Box No. 386, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

ASSISTANT METALLURGIST or chemist is required for research work on high-temperature materials, hard metals, and cutting-tool materials. Applicants should preferably have had previous experience of laboratory work and should possess a metallurgical or chemical degree, a Higher National certificate, or equivalent qualification. Apply, quoting reference HM, and stating age, qualifications, and experience, to Director of Research, The Thomson-Houston Co., Ltd., Rugby.

METALLURGIST or chemist with University degree or equivalent required in modern metallurgical research laboratory for investigational work on problems associated with metal arc welding. Some experience in research or industry desirable; a knowledge of arc welding an advantage but not essential. Excellent salary and prospects. Applications, giving full details, to: Research Manager, Ref.M., Murex Welding Processes, Ltd., Waltham Cross, Herts.

METALLURGIST required to take charge of metallographic and photographic sections of the research laboratories of a large light alloy firm, situated near London. This is a senior appointment, occasioned by the expansion of the firm's activities, and the minimum salary envisaged for a suitably qualified person would be about £1000 p.a. Candidates should have a good Honours degree or its equivalent with several years' experience, including modern metallographic techniques, in the light alloy or non-ferrous industries. Applications, which will be treated in strict confidence, giving full details of age, qualifications, and experience, should be addressed to Box No. 385, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

METALLURGIST with experience in casting technology required for Research, Development, and Technical Sales liaison work on magnesium alloys. Applicant should possess Hons. Degree in Metallurgy or A.I.M. Progressive appointment carrying pension and life assurance. Applications invited, stating reference JMS.J10 and details of age, qualifications, and experience addressed to Personnel Officer (Staff), Magnesium Elektron Ltd., P.O. Box No. 6, Lumm's Lane, Clifton Junction, Swinton, Nr. Manchester.

METALLURGISTS having a good Honours degree and preferably with research experience are required for research on materials for use at high temperatures and also on hard metals and cutting-tool materials. Apply, quoting reference HM, and stating age, qualifications, and experience, to Director of Research, The British Thomson-Houston Co., Ltd., Rugby.

THE QUASI-ARC CO., LTD., Bilston, Staffs., require a Metallurgist or Chemist to take charge of their Automatic Welding Materials Development Laboratory. Experience in the field of automatic or manual electrode development, or otherwise in the welding industry, would be of considerable advantage. Salary according to qualifications and experience. Apply to the Research and Development Manager, stating age, qualifications, and experience.

THE UNIVERSITY OF SHEFFIELD

Applications are invited for the T. I. RESEARCH FELLOWSHIP tenable in the Department of Metallurgy. The object of the Fellowship is to advance knowledge in the field of Metallurgy; candidates should already have some research experience, but not necessarily in this field. Normal tenure will be five years, but the appointment will be for two years in the first instance and thereafter will be renewable annually. Stipend £750 per annum for the first year, rising by annual increments of £50 to £950 per annum, together with superannuation provision under the F.S.S.U. A higher stipend may be paid to an exceptional candidate. Applications (3 copies) including the names and addresses of referees and, if desired, copies of testimonials, should reach the Registrar (from whom further particulars may be obtained) not later than 31 March 1955.

METALLURGICAL TRANSLATIONS from French, German, and Italian undertaken by translator with considerable non-ferrous experience. 30*s.* per 1000 words. References supplied. Mrs. Secretan, M.A., 8 Cambridge Rd., Wimbledon, London, S.W.20.